No. 200300333

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Colorado Wheat Research Foundation

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE , OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN ITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542 ET SEQ., 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Ankor'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this nineteenth day of March, in the year two thousand and four.

Attest:

Acting Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions* — Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
Colorado Wheat Research Foundation

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
CO99508

3. VARIETY NAME
Ankor

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
7700 E. Arapahoe Rd.
Suite 220
Englewood, CO 80112

5. TELEPHONE *(include area code)*
(303) 721-3300

6. FAX *(include area code)*
(303) 721-7555

FOR OFFICIAL USE ONLY

PVPO NUMBER
200300333

FILING DATE
September 5, 2003

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Association

8. IF INCORPORATED, GIVE STATE OF INCORPORATION

9. DATE OF INCORPORATION

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Dr. Scott D. Haley
Associate Professor - Wheat Breeder
Soil and Crop Sciences Department
Colorado State University
Fort Collins, CO 80523

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 3652.00
DATE 9/03/2003

CERTIFICATION FEE:
$ 432.00
DATE 2/23/2004

11. TELEPHONE *(include area code)*
(970) 491-6483

12. FAX *(include area code)*
(970) 491-0564

13. E-MAIL
scott.haley@colostate.edu

14. CROP KIND *(Common Name)*
Wheat, Common

16. FAMILY NAME *(Botanical)*
Gramineae

15. GENUS AND SPECIES NAME OF CROP
Triticum aestivum L.

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☑ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? *(OPTIONAL)*
☐ YES ☑ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERICALIZATION: _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)
- a. ☑ Exhibit A. Origin and Breeding History of the Variety
- b. ☑ Exhibit B. Statement of Distinctness
- c. ☑ Exhibit C. Objective Description of Variety
- d. ☑ Exhibit D. Additional Description of the Variety *(Optional)*
- e. ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
- f. ☑ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
- g. ☑ Filing and Examination Fee ($3,652), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☑ YES *(If "yes", answer items 21 and 22 below)* ☐ NO *(If "no", go to item 23)*

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☑ YES ☐ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☑ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☑ YES ☐ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☑ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
NAME *(Please print or type)* Scott Haley		NAME *(Please print or type)*	
CAPACITY OR TITLE Associate Professor	DATE 8/31/03	CAPACITY OR TITLE	DATE

(See reverse for instructions and information collection burden statement)

INSTRUCTIONS

200300333

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $3,652 ($432 filing fee and $3,220 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvpo/pvp.htm

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

Foundation seed sold in Colorado, USA, September 5 2002

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

PVP Application
Ankor Hard Red Winter Wheat
Exhibit A – Origin and Breeding History of the Variety

Pedigree – Ankor (PI 632275) was selected from the following crosses and backcrosses:

'Akron'/'Halt'//4*Akron

Experimental designation – Ankor was assigned the experimental identification number CO99508 in 1999.

Parents – The parents of Ankor are:

1) **Akron** – a Russian wheat aphid [RWA; *Diuraphis noxia* (Mordvilko)] susceptible wheat cultivar developed and released by the Colorado State University Agricultural Experiment Station in 1994. Akron was the recurrent parent used in the development of Ankor.

2) **Halt** – a RWA-resistant wheat cultivar developed and released by the Colorado State University Agricultural Experiment Station in 1994. Halt was the donor parent of the *Dn4* RWA resistance gene carried by Ankor.

   Note: In spring 2003, a new strain (*biotype*) of RWA was identified in several eastern Colorado counties by Colorado State University extension and research personnel. This is the first reported observation of biotypic variation within North American populations of RWA. Standard greenhouse seedling screening with collections of this new biotype (provisionally denoted as "biotype B") have confirmed that it is virulent to Halt and all other RWA-resistant cultivars available in North America (e.g., Yumar, Prowers, Prowers 99, Prairie Red, Stanton, Ankor). These cultivars are still effective against the original "North American biotype" of RWA (now provisionally denoted as "biotype A").

Following are the breeding procedures used in the development of Ankor:

1994 – A cross was made in the CSU greenhouse between the cultivars Akron (as female) and Halt (as male). F1 seeds from the cross were vernalized in a cold chamber for 8 weeks at 2-4 °C. F1 plants were grown in the greenhouse and five different F1 plants were used (as female) in backcrossing with the recurrent parent Akron (as male).

1995 – BC1F1 progenies from each of the five crosses were screened for resistance to RWA in standard greenhouse seedling screening tests. RWA-resistant plants were vernalized in a cold chamber for 8 weeks at 2-4 °C. Following vernalization, BC1F1 plants were grown in the greenhouse for backcrossing (as female) to the recurrent parent Akron (as male). For each of the five crosses, three backcrosses were made with RWA-resistant progenies (e.g., 15 total crosses). Similarity of the BC1F1 phenotype to the recurrent parent phenotype (e.g., spike type, plant height, heading date) was used to select backcross progenies for crossing.

1996 – BC2F1 progenies from each of the fifteen crosses were screened for resistance to RWA in standard greenhouse seedling screening tests. RWA-resistant plants were vernalized in a cold chamber for 8 weeks at 2-4 °C. Following vernalization, BC2F1 plants were grown in the greenhouse for backcrossing (as female) to the recurrent parent Akron (as male). For each of the fifteen crosses, two backcrosses were made with RWA-resistant progenies (e.g., 30 total crosses). Similarity of the BC2F1 phenotype to the

recurrent parent phenotype (e.g., spike type, plant height, heading date) was used to select backcross progenies for crossing.

1997 – BC3F1 progenies from each of the 30 crosses were screened for resistance to RWA in standard greenhouse seedling screening tests. RWA-resistant plants were vernalized in a cold chamber for 8 weeks at 2-4 °C. Following vernalization, BC3F1 plants were grown in the greenhouse for backcrossing (as female) to the recurrent parent Akron (as male). For each of the 30 crosses, one backcross was made with a RWA-resistant progeny (e.g., 30 total crosses). Similarity of the BC3F1 phenotype to the recurrent parent phenotype (e.g., spike type, plant height, heading date) was used to select backcross progenies for crossing.

1998 – BC4F1 progenies from each of the 30 crosses were screened for resistance to RWA in standard greenhouse seedling screening tests. RWA-resistant plants (from 3-7 per cross) were vernalized in a cold chamber for 8 weeks at 2-4 °C. Following vernalization, BC4F1 plants were increased to the BC4F1:2 generation by self pollination in the greenhouse during winter 1998-1999.

1999 – 178 BC4F1:2 lines (BC4 F1-derived F2 lines) were harvested from the greenhouse increase in spring 1999. Seed of each line was vernalized in a cold chamber for 8 weeks at 2-4 °C. Vernalized seedlings were grown in single rows in a hand-transplanted field nursery in the San Luis Valley, CO, during summer 1999. Based on visual similarity to the recurrent parent phenotype, 85 lines were selected and advanced to single replication yield trials in September 1999. Experimental number CO99508 was assigned to one of these 85 lines.

2000 – 85 BC4F1:3 lines were grown in single replication yield trials at three locations in Colorado (Julesburg, Akron, Fort Collins). Variation among the lines was noted for grain yield, test weight, plant height, heading date, straw strength, and overall agronomic adaptation. Grain harvested from the trials in July 2000 was used for milling and baking quality evaluations in August 2000, including NIR protein content, NIR grain hardness, Mixograph water absorption, Mixograph mixing time, and Mixograph mixing tolerance. Based on these criteria, five lines (CO99508 and four others) were advanced for entry in statewide variety trials in 2001. The 85 BC4F1:3 lines were also grown in bulk seed increase plots in Yuma, AZ. Prior to harvest, 800 spikes were selected from the lines at random for headrow purification and Breeder Seed increase. The remnant seed from the bulk seed increases was used as the seed source for the UVPT planted in September 2000.

2001 – Five BC4F1:4 lines were grown in replicated yield trials at 10 dryland locations in Colorado. Variation among the lines was noted for grain yield, test weight, winterhardiness, and overall agronomic adaptation. Grain harvested from the trials in July 2001 was used for milling and baking quality evaluations in August 2001, including NIR protein content, NIR grain hardness, Mixograph water absorption, Mixograph mixing time, and Mixograph mixing tolerance. Based on these criteria, two lines (CO99508 and one other) were retained for testing in statewide variety trials in 2002. For generation of breeder seed, 756 BC4F3:4 headrows (from spikes selected in Yuma, AZ, in 2000) of each of the five lines were grown in Yuma, AZ. For each line, remnant seed of 756 spikes was tested for RWA resistance in standard greenhouse seedling screening tests. Based on visual uniformity, and confirmation of a homogeneous (e.g., nonsegregating) reaction

to RWA in greenhouse tests, 281 BC4F3:4 headrows were composited to form the Breeder Seed of CO99508.

2002 – Two BC4F3:5 lines (CO99508 and one other) were grown in replicated trials at 10 dryland and 3 irrigated locations in statewide variety trials in 2002. A 12-acre Foundation Seed increase was grown under irrigation in Colorado. Based on yield and test weight performance in the 2001 and 2002 Colorado UVPT, CO99508 was assigned the name Ankor and released for sale to seed producers in September 2002.

Ankor is uniform. Variants are limited to slightly taller plants that occur at a frequency of less than 1 in 1,000 plants and plants with brown glumes that occur at a frequency of less than 1 in 1,000 plants. The variants in Ankor as well as the typical plants in Ankor are commercially acceptable.

Ankor is stable. When sexually reproduced, Ankor remains unchanged in its essential and distinctive characteristics. Ankor was observed to be phenotypically uniform and stable during the last four generations (preliminary seed increase in 1999, bulk seed increase in 2000, Breeder seed increase in 2001, Foundation seed increase in 2002).

PVP Application
Ankor Hard Red Winter Wheat
Exhibit B – Statement of Distinctness

Ankor is most similar to the hard red winter wheat cultivar Akron, with roughly 97% of its parentage coming from Akron. In standard greenhouse seedling screening tests, however, Ankor is resistant to biotype A of Russian wheat aphid (RWA) while Akron is very susceptible (**Table 1**).

- average resistance rating of Ankor (2.0) is significantly (P<0.001) lower than that of Akron (4.9).
- average percentage of plants showing a resistant reaction of Ankor (88.2) is significantly (P<0.001) greater than that of Akron (0.0).

Table 1. Greenhouse seedling Russian wheat aphid (biotype A) resistance reaction of Akron and Ankor hard red winter wheats (2000-2003).[†]

		Akron				Ankor			
Year	Nursery	Number Plants	Rating[‡]	Resistant Plants	% Resistant	Number Plants	Rating[‡]	Resistant Plants	% Resistant
2000	AYN	9	5	0	0	9	2	7	77.8
2001	UVPT Rep 1	11	5	0	0	11	2	11	100.0
2001	UVPT Rep 2	11	5	0	0	9	2	6	66.7
2002	UVPT Rep 1	11	5	0	0	11	2	11	100.0
2002	UVPT Rep 2	11	5	0	0	11	2	11	100.0
2003	UVPT Rep 1	11	5	0	0	9	2	9	100.0
2003	UVPT Rep 2	11	4	0	0	11	2	8	72.7
Average			**4.9*** **		**0.0** **		**2.0** **		**88.2*** **

*** Mean RWA resistance ratings and percent resistant plant counts of Ankor and Akron significantly different based on a meaningfully paired Student's T Test procedure (P<0.001).

[†] Greenhouse seedling screening procedures based on Nkongolo, K.K., J.S. Quick, F.B. Peairs, and W.L. Meyer. 1991. Inheritance of resistance of PI 372129 wheat to the Russian wheat aphid. Crop Sci. 31:905-907.

[‡] resistance rating scale (1=very resistant; 2=resistant; 3=moderately resistant; 4=susceptible; 5=very susceptible) based on visual appraisal of resistance reaction that includes severity of leaf rolling, chlorosis, stunting, and eventually death.

Note: Observation of susceptible plants within a RWA-resistant line or cultivar is not necessarily indicative of impurity of RWA resistance. Environmental conditions are known to affect expressivity (and thus penetrance) of the *Dn4* RWA resistance gene in standard greenhouse seedling screening tests.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT C
(*Wheat*)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S)
COLORADO WHEAT RESEARCH FOUNDATION

ADDRESS (Street and No. or RD No., City, State, and Zip Code)
7700 E. Arapahoe Rd.
Englewood, CO 80112

FOR OFFICIAL USE ONLY

PVPO NUMBER 200300333

VARIETY NAME ANKOR

TEMPORARY OR EXPERIMENTAL DESIGNATION C099508

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. [0][9] or [0][9]) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used:
Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

[1] 1=Common 2=Durum 3=Club 4=Other (SPECIFY) : _____

2. VERNALIZATION:

[2] 1=Spring 2=Winter 3=Other (SPECIFY) : _____

3. COLEOPTILE ANTHOCYANIN:

[1] 1=Absent 2=Present

4. JUVENILE PLANT GROWTH:

[2] 1=Prostrate 2=Semi-erect 3=Erect

5. PLANT COLOR (boot stage):

[2] 1 = Yellow-Green 2 = Green 3 = Blue-Green

6. FLAG LEAF (boot stage):

[1] 1 = Erect 2 = Recurved [1] 1 = Not Twisted 2 = Twisted

7. EAR EMERGENCE:

[0][2] Number of Days Earlier Than Prowers 99 *

[0][4] Number of Days Later Than Prairie Red *

8. ANTHER COLOR:

[1] 1 = Yellow 2 = Purple

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9. PLANT HEIGHT (from soil to top of head, excluding awns):

[05] cm Taller Than Prairie Red *

[08] cm Shorter Than Prowers 99 *

* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

10. STEM:

A. ANTHOCYANIN

[1] 1= Absent 2=Present

B. WAXY BLOOM

[2] 1=Absent 2=Present

C. HAIRINESS (last internode of rachis)

[1] 1=Absent 2=Present

D. INTERNODE (SPECIFY NUMBER) 5

[1] 1= Hollow 2=Semi-solid 3=Solid

E. PEDUNCLE

[2] 1=Absent 2=Present

[22] cm Length

11. HEAD (at Maturity):

A. DENSITY

[1] 1=Lax 2=Middense 3= Dense Very Lax

B. SHAPE

[1] 1 = Tapering 2= Strap 3 = Clavate 4 = Other (SPECIFY):

C. CURVATURE

[3] 1 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS

[4] 1 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

GLUMES (at Maturity):

A. COLOR

[1] 1 = White 2 = Tan 3 = Other (SPECIFY) : _____

B. SHOULDER

[2] 1 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK

[3] 1 = Obtuse 2 = Acute 3 =Acuminate

D. LENGTH

[2] 1 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

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12. GLUMES (at Maturity) *Continued*:

E. WIDTH

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[2] 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm) 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

[1] 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK

[1] 1=Rounded 2=Angular

C. BRUSH

[1] 1=Short 2=Medium 3=Long

[1] 1 = Not Collared 2 = Collared

D. CREASE

[3] 1 = Width 60% or less of Kernel
2 = Width 80% or less of Kernel
3 = Width Nearly as Wide as Kernel

[1] 1 = Depth 20% or less of Kernel
2 = Depth 35% or less of Kernel
3 = Depth 50% or less of Kernel

E. Color

[3] 1=White 2= Amber 3= Red
4= OTHER (Specify)

G. PHENOL REACTION *(see instructions)*:

[4] 1 = Ivory 2 = Fawn
3 = Light Brown 4 = Dark Brown
5 = Black

F. TEXTURE

[1] 1=Hard 2=Soft

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

[3]	Stem Rust *(Puccinia graminis* f. sp. *tritici)* (race mixture)	[1]	Leaf Rust *(Puccinia recondita* f. sp. *tritici)* (race mixture)
[1]	Stripe Rust *(Puccinia striiformis)* (race mixture)	[0]	Loose Smut *(Ustilago tritici)*
[0]	Tan Spot *(Pyrenophora tritici-repentis)*	[0]	Flag Smut *(Urocystis agropyri)*
[0]	Halo Spot *(Selenophoma donacis)*	[0]	Common Bunt *(Tilletia tritici* or *T. laevis)*
[0]	*Septoria nodorum* (Glume Blotch)	[0]	Dwarf Bunt *(Tilletia controversa)*
[0]	*Septoria avenae* (Speckled Leaf Disease)	[0]	Karnal Bunt *(Tilletia indica)*
[0]	*Septoria tritici* (Speckled Leaf Blotch)	[0]	Powdery Mildew *(Erysiphe graminis* f. sp. *tritici)*
[0]	Scab (*Fusarium* spp.)	[0]	"Snow Molds"

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14. Disease *(Continued)* (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

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PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

[0]	"Black Point" (Kernel Smudge)	[0]	Common Root Rot *(Fusarium, Cochliobolus* and *Bipolaris* spp.*)*
[1]	Barley Yellow Dwarf Virus (BYDV)	[0]	Rhizoctonia Root Rot *(Rhizoctonia solani)*
[1]	Soilborne Mosaic Virus (SBMV)	[0]	Black Chaff *(Xanthomonas campestris* pv. *translucens)*
[0]	Wheat Yellow (Spindle Streak) Mosaic Virus	[0]	Bacterial Leaf Blight *(Pseudomonas syringae* pv. *syringae)*
[3]	Wheat Streak Mosaic Virus (WSMV)	[ ]	Other (SPECIFY)
[ ]	Other (SPECIFY)	[ ]	Other (SPECIFY)
[ ]	Other (SPECIFY)	[ ]	Other (SPECIFY)
[ ]	Other (SPECIFY)	[ ]	Other (SPECIFY)

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

[1]	Hessian Fly *(Mayetiola destructor)* Great Plains Biotype	[ ]	Other (SPECIFY)
[0]	Stem Sawfly *(Cephus* spp.)	[ ]	Other (SPECIFY)
[0]	Cereal Leaf Beetle *(Oulema melanopa)*	[ ]	Other (SPECIFY)
[2]	Russian Aphid *(Diuraphis noxia* (Biotype A)	[1]	Other (SPECIFY) Russian Wheat Aphid (Biotype B)
[1]	Greenbug *(Schizaphis graminum)*	[ ]	Other (SPECIFY)
[0]	Aphids	[ ]	Other (SPECIFY)

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS

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PVP Application
Ankor Hard Red Winter Wheat
Exhibit D – Additional Description of the Variety (optional)

The following additional descriptive information is presented:

1) Official Colorado Agricultural Experiment Station release notice for Ankor winter wheat.

2) Report of evaluation of kernel morphology, hardness, and color of Ankor winter wheat by USDA-GIPSA-Technical Services Division.

3) Approval of the name Ankor by USDA-AMS.

4) Heading date, plant height, and coleoptile length data from the 2001 and 2002 Colorado Variety Performance Tests (**Table 2**).

5) Grain yield and test weight data from the Colorado Uniform Variety Performance Trial (UVPT) for the 2001, 2002, and 2003 growing seasons (**Table 3**).

6) Grain yield and test weight for Ankor and other entries tested in Colorado Irrigated Variety Performance Trials (IVPT; 2002) (**Table 4**).

7) Physical and milling characteristics of Ankor and check varieties from four sub-regional composite evaluations of the 2002 Southern Regional Performance Nursery (**Table 5**).

8) Dough mixing and breadbaking characteristics of Ankor and check varieties from four sub-regional composite evaluations of the 2002 Southern Regional Performance Nursery (**Table 6**).

Colorado Agricultural Experiment Station
Colorado State University

Notice of Release of ANKOR Winter Wheat

'Ankor' hard red winter wheat (*Triticum aestivum* L.) was developed by the Colorado Agricultural Experiment Station and released to seed producers in August 2002. Ankor was released because of its resistance to the Russian wheat aphid [RWA, *Diuraphis noxia* (Mordvilko)] and adaptation for dryland production in eastern Colorado and the west-central Great Plains.

Ankor was selected from the crosses and backcrosses 'Akron'/'Halt'//4*Akron made between 1994 and 1998. Halt (PI 584505) and Akron (PI 584504) are cultivars released by CSU in 1994. Progeny were screened for RWA resistance in standard greenhouse screening tests (Nkongolo, 1989) after each backcross and resistant plants were used for the next backcross. BC_4F_1 plants were screened for RWA resistance in fall 1998 and resistant plants were increased by self pollination in the greenhouse during winter 1998-1999. Vernalized seedlings of $BC_4F_{1:2}$ lines were grown in a hand-transplanted field nursery in the San Luis Valley, CO, during summer 1999. Eight-five $BC_4F_{1:3}$ lines, including Ankor (assigned experimental number CO99508), were harvested in early September 1999 and planted in single replication trials at three dryland locations in eastern Colorado in late September 1999. Ankor was advanced from preliminary yield trials in 1999 for entry in Colorado Dryland Variety Performance Trials (Colorado UVPT) in 2001 and 2002. Breeder Seed of Ankor originated from a composite of 281 $BC_4F_{3:4}$ head-rows selected from a headrow purification (for RWA resistance and visual uniformity) grown in Yuma, AZ, in 2001. Foundation Seed was grown under irrigation in Colorado in 2002.

Ankor is an awned, white-chaffed, medium maturity, semidwarf hard red winter wheat. Ankor is medium maturing (144.8 d to heading from 1 January), about 4 d later than 'Prairie Red' (PI 605390) and similar to Akron. Plant height of Ankor is medium-short (76.5 cm), 4.3 cm taller than Prairie Red and similar to Akron. Coleoptile length of Ankor is slightly less than Prairie Red and similar to Akron. The straw strength of Ankor is good, slightly better than Akron based on limited evaluation and observation in the 2002 Colorado Irrigated Variety Performance Trial (IVPT). On the basis of field evaluations under natural infection in Colorado and cooperative evaluations through the USDA Regional Testing Program, Ankor is moderately resistant to stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks & E. Henn.), susceptible to leaf rust (caused by *Puccinia triticina* Eriks.), and susceptible to both Wheat streak mosaic virus and Barley yellow dwarf virus. Ankor is susceptible to the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)] and greenbug [*Schizaphis graminum* (Rondani)], and resistant to RWA.

Ankor was tested in 11 trial locations of the dryland Colorado UVPT from 2001 to 2002. In these trials, Ankor (2647 kg ha^{-1}) showed similar yield as Prairie Red (2620 kg ha^{-1}; $P>0.05$) and less than Akron (2714 kg ha^{-1}; $P>0.05$). Test weight averages from dryland trials in 2001 and 2002 show that Ankor (731 kg m^{-3}) has similar test weight to both Akron (734 kg m^{-3}) and Prairie Red (731 kg m^{-3}). Ankor was tested in three trial locations of the Colorado Irrigated Variety Performance Trials (Colorado IVPT) during 2002. In these trials, Ankor (5301 kg ha^{-1}) yielded more than Akron (4670 kg ha^{-1}; $P>0.05$), Prairie Red (4918 kg ha^{-1}; $P>0.05$), and 'Yumar' (PI 605388; 5012 kg ha^{-1}; $P>0.05$).

Milling and bread baking characteristics of Ankor were determined from two multi-location composite evaluations from the 2000 and 2001 growing seasons and four single-location evaluations from the 2001 growing season. Relative to its recurrent parent Akron, Ankor had higher grain volume weight (727 versus 721 kg m^{-3}), kernel weight (24.8 versus 23.6 mg $kernel^{-1}$), and percent large kernels (36.3 versus 27.5% kernels that do not pass a Tyler #7 sieve, 2.92 mm openings). Flour protein concentration, mixograph mixing properties, flour ash, Quadromat Senior flour extraction, and pup loaf volume and crumb grain scores were similar for Ankor and Akron.

The Colorado Agricultural Experiment Station will maintain breeder seed of Ankor. Ankor has been submitted for U.S. Plant Variety Protection under P.L. 91-577 with the certification option. Small quantities of seed for research purposes may be obtained from the Wheat Breeding and Genetics Program in the Soil and Crop Sciences Department at Colorado State University for at least 5 yr from the date of release.

Approval

15Oct02	10/23/02
Head, Soil and Crop Sciences Department, Colorado State Univ. — Date	Director, Colorado Agricultural Experiment Station — Date

USDA

United States Department of Agriculture

Grain Inspection Packers and Stockyards Administration

Technical Services Division
Board of Appeals and Review
10383 N. Executive Hills Blvd.
Kansas City, MO 64153
(816) 891-0418

2003 00333

January 14, 2002

Dr. Scott Haley
Colorado State University
Department of Soil and Crop Sciences
Fort Collins, CO 80523-1170

RE: Evaluation of Variety CO99508

Thank you for submitting the type sample(s) of CO99508 which is intended to be released as Hard Red Winter wheat. We evaluated the variety using the criteria listed below to determine how well suited it is for the current visual wheat classification system. Based on this review, we would classify the subject variety Hard Red Winter wheat. 1

EVALUATION CRITERIA (based on intended class):

	ACCEPTABLE	UNACCEPTABLE
Kernel Morphology	X	
Hardness Index	80	
Color	X	

ADDITIONAL COMMENTS:

Weight of sample submitted was 1985 grams. To ensure this variety is properly classed throughout the national inspection system, please submit a minimum of 4000 grams so we can distribute type samples to the various inspection laboratories.

Sincerely,

Eurvin Williams

Eurvin Williams
Chairman

1 The above decision applies only to the quantity of wheat submitted for our review and does not apply to any other identified lots. The effect of environment on morphological characteristics may be significant and necessitate reevaluation.

USDA

200300333

United States Department of Agriculture

Marketing and Regulatory Programs

Agricultural Marketing Service

Livestock and Seed Program

Seed Regulatory and Testing Branch

B-306, Rm. 213
BARC-East
Beltsville, Maryland
20705-2325

Phone:
301-504-8138

FAX:
301-504-8098

E-mail:
Al.burgoon@usda.gov

Web Site:
www.ams.usda.gov/lsg/seed.htm

July 24, 2002

Dr. Scott Haley
Colorado State University
Soil and Crop Sciences Department
Fort Collins, Colorado 80523

Dear Dr. Haley:

In response to your inquiry concerning variety names, we have checked our own database, the UPOV-ROM database, and the EEC Common Catalog and found the following:

Name Cleared: 'Ankor' for wheat. Notes: We cleared this name for you on 11/21/2000. There is an 'Anka' wheat.

Notes: **We are no longer doing Trademark searches on proposed variety names.** The Trademark database can be accessed via the Internet at the following web site: "http://www.uspto.gov." Because there is no variety registration system, we cannot assure you that these names are free of conflicts. Moreover, our clearance confers no legal precedence.

We are happy to help you in this matter. **Please inform us about your new variety releases, including the kind, release date, and experimental designation(s) of the new varieties. Also, please indicate which names you decline to use so that they may be returned to the pool of available names.**

Thank you.

Sincerely,

Al Burgoon
Horticulturist
Testing Section

USDA

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Table 2. Heading date, plant height, and coleoptile length data from the 2001 and 2002 Colorado Variety Performance Tests.

Entry	Heading Date			Plant Height			Coleoptile
	2001 (n=1)†	2002 (n=3)	Avg. (n=4)	2001 (n=8)	2002 (n=5)	Avg. (n=13)	length (n=4)
	--- days from Jan. 1 ---			------ inches ------			-- mm --
Ankor	141.7	147.8	144.8	29.4	30.8	30.1	76.4
Prairie Red	139.0	143.5	141.3	28.3	28.5	28.4	85.6
Akron	142.0	147.1	144.6	29.8	30.6	30.2	78.1

† Number in parentheses indicates the number of replicated trials (for heading date and plant height) or nonreplicated evaluations (for coleoptile length).

Table 3. Grain yield and test weight data from the Colorado Uniform Variety Performance Trial (UVPT) for the 2001, 2002, and 2003 growing seasons.

Entry	2001		2002		2003		Average	
	Grain Yield	Test Weight	Grain Yield	Test Weight	Grain Yield	Test Weight	Grain Yield	Test Weight
	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu
Ankor	41.6	56.3	33.7	58.0	51.8	59.0	43.8	57.6
Akron	43.2	56.4	33.2	58.3	49.6	59.0	43.7	57.7
Trego	47.8	58.8	34.3	60.5	52.9	60.9	47.2	59.8
Stanton	46.3	56.8	32.6	59.7	49.4	59.9	45.0	58.4
Alliance	44.0	56.1	32.5	58.8	50.5	59.4	44.3	57.8
Yuma	43.1	56.0	30.0	58.9	53.0	59.3	44.3	57.7
Jagger	46.7	57.0	31.7	59.0	46.0	59.2	43.8	58.1
Prairie Red	40.7	56.2	34.6	58.6	50.2	58.8	43.0	57.5
Halt	42.9	56.1	34.7	58.5	46.7	58.7	42.8	57.4
Prowers 99	41.4	58.7	31.8	59.6	45.4	60.7	41.1	59.5
Average	43.5	56.8	32.9	58.9	49.6	59.5	43.9	58.2
Locations	8	8	3	3	6	6	17	17

Table 4. Grain yield (GY) and test weight (TW) for Ankor and other entries tested in Colorado Irrigated Variety Performance Trials (IVPT; 2002).

Entry	Fort Collins		Haxtun		Rocky Ford		Average	
	GY	TW	GY	TW	GY	TW	GY	TW
	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu
Ankor	59.2	60.6	85.4	56.1	92.1	55.4	78.9	57.4
Akron	54.7	60.9	73.3	57.4	80.6	57.1	69.5	58.5
Prairie Red	29.7	58.9	90.1	58.7	99.7	57.9	73.2	58.5
Yumar	54.8	60.9	85.7	59.6	83.3	56.5	74.6	59.0
Average	50.8	60.4	82.5	57.8	88.8	56.9	74.0	58.4

Table 5. Physical and milling characteristics of Ankor and check varieties from four sub-regional composite evaluations of the 2002 Southern Regional Performance Nursery.

Entry	Test Weight	Flour Ash†	Flour Yield†	SKCS Kernel Characteristics‡					
				Weight	St. Dev	Diameter	St. Dev.	Hardness	St.Dev.
	lb/bu	%	%	mg	mg	mm	mm	score	score
Kharkof	59.0	0.47	59.7	24.2	6.17	2.0	0.37	58.9	20.7
Scout66	60.0	0.42	67.7	27.4	8.09	2.1	0.46	73.1	15.2
TAM 107	58.6	0.41	65.2	28.6	8.28	2.2	0.50	76.4	15.1
Ankor	58.3	0.46	62.9	25.0	7.24	2.0	0.44	69.6	15.7

† Flour ash and flour yield from Brabender Quadromat Senior experimental mill.

‡ SKCS – Perten single kernel characterization system.

Table 6. Dough mixing and breadbaking characteristics of Ankor and check varieties from four sub-regional composite evaluations of the 2002 Southern Regional Performance Nursery.

Entry	Flour Protein	Mixograph			Bake Absorption	Bake Mix Time	Loaf Volume	Volume Regression	Crumb Grain
		Absorption	Mix Time	Tolerance					
	%	%	min	score	%	min	cc	cc/%	score
Kharkof	13.5	65.0	3.9	3.3	63.5	5.3	933	60.9	4.1
Scout66	13.2	64.8	2.7	3.3	63.1	3.7	945	63.9	3.9
TAM 107	12.2	62.7	2.8	3.0	62.2	4.0	928	68.7	3.0
Ankor	12.3	63.6	3.4	3.3	62.7	4.6	855	59.6	3.6

REPRODUCE LOCALLY. Include form number and edition date on all reproductions. FORM APPROVED - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Colorado Wheat Research Foundation	CO99508	Ankor
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
7700 East Arapahoe Road Suite 220 Englewood, CO 80112	(303) 721-3300	(303) 721-7555
	7. PVPO NUMBER 200300333	

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** ☑ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☑ YES ☐ NO

10. Is the applicant the original owner? ☐ YES ☑ NO **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
☐ YES ☐ NO **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
☑ YES ☐ NO **If no, give name of country**

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

The wheat cultivar for which Plant Variety Protection is hereby sought was developed by a team of researchers led by Dr. Scott D. Haley, an employee of Colorado State University (CSU). By agreement between Dr. Haley and CSU, all rights to wheat cultivars developed by his team while employed by CSU are assigned to CSU. Ownership of the cultivar has been transferred from CSU to the Colorado Wheat Research Foundation, Inc., 7700 E. Arapahoe Road, Suite 220, Englewood, CO 80112.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.